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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) **Assembly Board with Strip Conductor Fuse and Process for Operating an Electrical Circuit Arrangement Mounted on an Assembly Board**

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(57) 7 Claims

Notice: This application is as filed and may therefore contain an incomplete specification.



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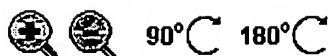


90°C 180°C

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ABSTRACT

The invention concerns an assembly board with electrical conductor strips introduced thereon and with a strip conductor fuse as well as an operating process for a circuit arrangement mounted on an assembly board. The strip conductor fuse (3a, 3c) comprises two conductor strip segments (3a, 3c) through which current passes in opposite directions and these segments are arranged at such a short distance from one another that the magnetic field arising in one conductor strip segment (3a, 3c) through which current passes operates on the electrical charge carriers flowing through the other conductor strip segment (3c, 3a) and vice versa in the case of an electrical short circuit. If an electrical short circuit occurs, the electrical charge carriers of the plasma arising due to the burning off or vaporization of strip conductor fuse (3a, 3c) are reliably removed from the region of the strip conductor fuse due to the interaction with the above-named magnetic fields and thus the short-circuit current is reliably interrupted.



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ASSEMBLY BOARD WITH STRIP CONDUCTOR FUSE AND
PROCESS FOR OPERATING AN ELECTRICAL CIRCUIT ARRANGEMENT
MOUNTED ON AN ASSEMBLY BOARD

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FIELD OF THE INVENTION

The invention concerns an assembly board with a strip
conductor fuse and a process for operating an electrical
circuit arrangement mounted on an assembly board.

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BACKGROUND OF THE INVENTION

Assembly boards are known with electrical conductor
strips incorporated thereon for electrical connection of
component parts mounted on the assembly board, whereby at
least one conductor strip is formed as a strip conductor
safety device or fuse, which interrupts the connection to
the electrical current source in the case of an anomalous
operating condition, particularly if an electrical short
circuit occurs. This conductor strip configured as the

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safety device (fuse) usually has a region with a constricted cross section, which is burned off or vaporized when an electrical short circuit occurs, so that the conductor strip is disrupted in this region. Of course, it has been shown
5 that plasma that arises during the burning off process or during vaporization of the strip conductor fuse continues to carry the supply current. Thus, the behavior of the strip conductor fuse cannot be controlled. In order to assure a secure exclusion of the supply voltage when a short circuit
10 occurs, this strip conductor fuse must be furnished with another safety measure.

SUMMARY OF THE INVENTION

15 The task of the invention is to produce an assembly board with electrical components introduced thereon, which is equipped with an improved strip conductor fuse, as well as to provide an improved operating procedure for a circuit arrangement mounted on an assembly board.

20 The assembly board of the invention has electrical conductor strips for the electrical connection of the components mounted on the assembly board and is equipped



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with a strip conductor fuse, which interrupts the connection to the supply voltage in the case of an anomalous operating condition and particularly if an electrical short circuit occurs. According to the invention, the strip conductor

5 fuse is formed of two conductor strip segments with electrical current flowing in the opposite direction, and these are arranged next to each other at such a small distance that the magnetic fields proceeding from each of these strip conductor segments with current flowing through

10 operate on the electrical charge carriers that flow in the other strip conductor segment. This provision ensures that a short circuit current due to the plasma forming during the burning off or vaporizing of the conductor strip fuse is reliably stopped, since the electrical charge carriers of

15 this plasma are removed from the region of the strip conductor fuse by the effect of the magnetic fields produced by the oppositely directed electrical currents in the two conductor strip segments of the strip conductor fuse. Advantageously, the minimum distance between the two

20 conductor strip segments of the strip conductor fuse is at most 10 mm. It is thus assured that the strength of the



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above-named magnetic fields is sufficient to spin out the electrical charge carriers of the plasma. In addition, the two conductor strip segments of the strip conductor fuse advantageously run parallel to one another, so that the current flow is antiparallel in these two conductor strip segments. In this way, the repulsive effect of the above-named magnetic fields on the electrical charge carriers of the plasma is optimized. At least one of the two conductor strip segments of the strip conductor fuse advantageously has a region with a constricted cross section. This region of the strip conductor fuse is first burned off or vaporized if an electrical short circuit occurs. The sensitivity of the strip conductor fuse may be adjusted within certain limits by this constricted region.

The operating process of the invention for an electrical circuit arrangement mounted onto an assembly board is characterized by a strip conductor fuse comprised of two conductor strip segments with electrical current flowing through in opposite directions, whereby these conductor strip segments are arranged at such a small distance to one another that if an anomalous operating



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condition occurs, and particularly if an electrical short circuit occurs, at least one region of the strip conductor fuse is vaporized into a plasma and the current flow in the plasma is interrupted by means of the interaction of the electrical charge carriers with the magnetic fields, which are produced by the currents flowing in the conductor strip segments of the strip conductor fuse. This operation permits omitting the previously used safety arrangements, such as, for example, the incorporation of a commercial safety fuse. Since the strip conductor fuse of the invention is considerably more cost favorable than a safety fuse, manufacturing costs can be reduced by its use.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be explained in more detail in the following on the basis of a preferred example of embodiment. Here:

Figure 1 shows a section from the layout of the assembly board of the invention according to the preferred example of embodiment;



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Figure 2 shows a circuit diagram of the components mounted on the assembly board illustrated in Figure 1.

BEST MODE FOR CARRYING OUT THE INVENTION

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The assembly board according to the preferred example of embodiment of the invention is part of an electronic operating device for electrical lamps. It is equipped with electrical conductor strips for electrical connection of the components of the electronic operating device mounted on the assembly board. The back side of the assembly board with the conductor strips arranged thereon is shown as an excerpt in Figure 1. Figure 2 shows the circuit arrangement of the components mounted on the assembly board according to the preferred example of embodiment of the invention. These components comprise components of an electronic serial connection device for operating electric lamps or bulbs.

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The assembly board of the invention has two terminals 1, 2 for a mains voltage source. Two conductor strips 3, 4 run between the two mains terminals 1, 2. The first conductor strip 3 is extended from the first mains connection 1 up to a first connection 5, whereas the second

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conductor strip 4 proceeds from the second mains terminal 2 and terminates at a second connection point 6. The entire load circuit provided with mains voltage is arranged between the two electrical connections 5 and 6, so that the entire supply current flows through the two conductor strips 3, 4 during the operation. The first conductor strip 3 is configured as a strip conductor fuse. It has two conductor strip segments 3a, 3b running parallel to one another. The supply current flows in opposite directions through these segments, i.e., in the counter or antiparallel direction. The distance of these two conductor strips from one another is approximately 3 mm. The second conductor strip segment 3b has a region 3c with a constricted cross section. This constricted region 3c of the second conductor strip segment 3b extends over a length of approximately 6 mm. The width of the second conductor strip segment 3b amounts to approximately 1 mm, whereas the width of the constricted region 3c measures only approximately 0.2 mm.

Conductor strip segments, 3a, 3c running parallelly next to one another and through which the supply current flows, each produce a magnetic field. Since the flow



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direction of the supply current is antiparallel in the two conductor strip segments 3a, 3c, the magnetic field proceeding from conductor strip segment 3a exercises a repulsive force on the electrical charge carriers in conductor strip segment 3c. In contrast, the magnetic field arising from conductor strip segment 3c through which current passes exercises a repulsive force on the electrical charge carriers in conductor strip segment 3a.

In the case of an anomalous operating state, particularly if an electrical short circuit occurs, a high short-circuit current flows through strip conductor fuse 3a, 3c, and this leads to a burning off or vaporization of the constricted strip conductor region 3c. The plasma arising in this process conducts electricity and would thus also bear the short-circuit current. However, since the magnetic field produced by conductor strip segment 3a through which current passes effectively repels the electrical charge carriers of the plasma, these charge carriers are removed from the region of strip conductor fuse 3a, 3c, and the short-circuit current is reliably interrupted. The repulsive force acting on the electrical charge carriers of



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the plasma has a square dependence on the electrical current intensity and on the reciprocal distance of the two conductor strip segments 3a, 3c. This is meaningless during normal operation, due to the small current intensity of

5 normal operation in comparison to the short-circuit current. The short circuit current intensity lies on the order of magnitude of 50 A and the magnetic field operating on the electrical charge carriers in the plasma has a field intensity of several millitesla when an electrical short

10 circuit occurs. The current intensity of the supply current in normal operation, on the other hand, is two orders of magnitude smaller than the short-circuit current intensity.

Figure 2 shows in schematic representation a preferred application of the assembly board of the invention on an

15 operating device for electrical lamps. A current-compensated filter choke is joined to connections 5, 6 by means of coils L1, L2, and a bridge rectifier GL is connected by means of a filter condenser C, and the constant voltage output of this rectifier is connected with a

20 connection mains part 7, for example, with a half-bridge



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inverter with downstream-connected LC output circuit, in which at least one lamp is connected.

The invention is not limited to the example of embodiment that is explained in detail above. For example, the two conductor strip segments 3a, 3c of the strip conductor fuse need not absolutely run parallel. They may also form an acute angle with one another. Further, it is also possible to provide both conductor strip segments 3a, 3b of the strip conductor fuse with a region 3c, which is constricted in cross section.

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CLAIMS

What is claimed is:

- 5 1. Assembly board with electrical conductor strips introduced thereon for the electrical connection of components mounted on the assembly board, whereby at least one conductor strip (3) is configured as a strip conductor fuse, which interrupts the connection to the electrical
- 10 voltage source (1, 2) in the case of an anomalous operating condition, particularly if an electrical short circuit occurs, is hereby characterized in that the strip conductor fuse comprises two conductor strip segments (3a, 3c) through which electrical current flows in opposite directions, and
- 15 the segments are arranged at such a small distance from one another that the magnetic fields arising from conductor strip segments (3a, 3c) through which current passes operate on the electrical charge carriers flowing in the other
- 20 conductor strip segment (3c, 3a), so that the electrical charge carriers of the plasma that arises in the case of an electrical short circuit are removed from the region of the strip conductor fuse (3a, 3c).



2. Assembly board according to Claim 1, further characterized in that the minimal distance between the two conductor strip segments (3a, 3b) of the strip conductor fuse amounts to a maximum of 10 mm.

3. Assembly board according to Claim 1, further characterized in that the two conductor strip segments (3a, 3b) of the strip conductor fuse run parallel next to one another, and the current flow in these conductor strip segments (3a, 3b) is antiparallel.

4. Assembly board according to Claim 1, further characterized in that at least one of the two conductor strip segments (3b) of the strip conductor fuse has a region (3c) with a constricted cross section.

5. Electrical circuit arrangement with an assembly board according to Claim 1.

6. Process for the operation of an electrical circuit arrangement mounted on an assembly board, whereby the



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assembly board is provided with conductor stripes for the electrical connection of the electrical components of the circuit arrangement and with a strip conductor fuse, which interrupts the voltage supply of the circuit arrangement in the case of an anomalous operating condition, particularly when an electrical short circuit occurs, is hereby characterized by the fact that the strip conductor fuse is comprised of two conductor strip segments (3a, 3c) through which the electrical current flows in opposite directions, and these segments are arranged at such a short distance from one another that in the case of an anomalous operating condition, particularly when an electrical short circuit occurs, at least one region (3c) of the strip conductor fuse (3a, 3c) vaporizes into a plasma and the current flow in the plasma is interrupted by the interaction of the electrical charge carriers with the magnetic fields that are produced by the currents flowing in conductor strip segments (3a, 3c) of the strip conductor fuse.



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7. Each and every novel feature or novel combination of features herein disclosed.

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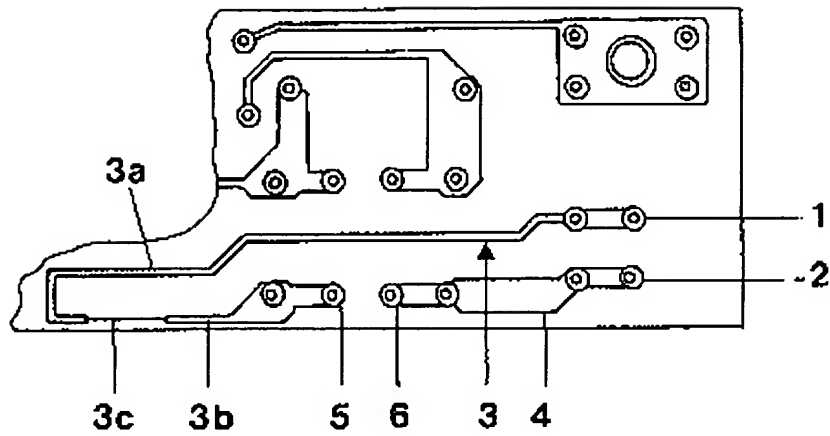


FIG. 1

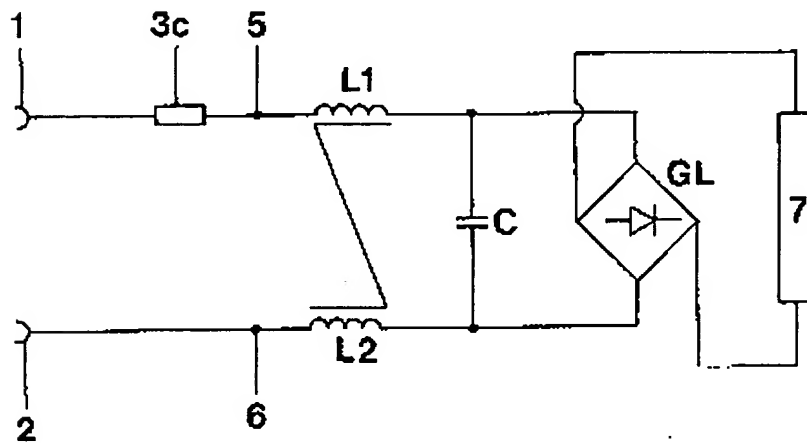


FIG. 2

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